A Report on the May 2002 CMMI® Workshop

Adoption Barriers and Benefits for Commercial Software and Information Systems Organizations

Mike Konrad
Mary Beth Chrissis
Bill Curtis
Mark Paulk

August 2002

A Report on the May 2002 CMMI® Workshop

Adoption Barriers and Benefits for Commercial Software and Information Systems Organizations

CMU/SEI-2002-SR-005

Mike Konrad
Mary Beth Chrissis
Bill Curtis
Mark Paulk

August 2002

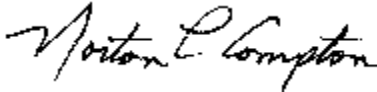**Software Engineering Process Management**

This report was prepared for the

SEI Joint Program Office
HQ ESC/DIB
5 Eglin Street
Hanscom AFB, MA 01731-2116

The ideas and findings in this report should not be construed as an official DoD position. It is published in the interest of scientific and technical information exchange.

FOR THE COMMANDER

Norton L. Compton, Lt Col, USAF
SEI Joint Program Office

For information about purchasing paper copies of SEI reports, please visit the publications portion of our Web site (http://www.sei.cmu.edu/publications/pubweb.html).

Table of Contents

List of Tables

Abstract

This special report summarizes the results of the CMMI® (Capability Maturity Model® Integration) Workshop held May 7-8, 2002. The CMMI workshop focused on two types of organizations: commercial software organizations and information systems organizations. The purpose of the workshop was to identify for these types of organizations: (1) barriers to the adoption of CMMI, (2) benefits of CMMI adoption, (3) issues created by the migration from Software CMM (SW-CMM®) to CMMI. The results of this workshop are collections of comments concerning these defined topics regarding CMMI. No interpretation of these comments is provided.

® CMMI, CMM, and Capability Maturity Model are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.

---

1 Introduction

The CMMI (Capability Maturity Model Integration) Workshop on adoption barriers and benefits for commercial software and information systems organizations was held May 7-8, 2002, at the Software Engineering Institute, Carnegie Mellon University, Pittsburgh, Pennsylvania. The workshop was co-sponsored by the Software Engineering Institute (SEI) and the International Software Research Institute (ISRI) of Carnegie Mellon University.

The objectives of the workshop were to better understand:

- the CMMI adoption needs of commercial software and information systems organizations
- the barriers and benefits of CMMI for these organizations
- issues that arise when migrating from Software CMM to CMMI

The sponsors of the workshop were Bill Peterson (SEI) and Jane Siegel (ISRI). The team that coordinated the workshop consisted of Mike Konrad (team leader), Mary Beth Chrissis, Mark Paulk, and Bill Curtis. Bill Curtis was unable to attend. Gibbie Hart, CMMI Transition Team lead, was an observer. Participants attending the workshop were not all from commercial software and information systems organizations targeted by the workshop. Participants in the workshop were:

- Richard Basque, Alcyonix
- Richard Bechtold, Abridge Technology
- Joseph Billi, Automatic Data Processing (ADP)
- Venkat Gopalan, DynCorp
- Subrata Guha, Satyam Computer Services Ltd.
- Keith Heston, Accenture
- Gargi Keeni, Tata Consultancy Services (TCS)
- Dennis Linscomb, DynCorp
- Mark Servello, ChangeBridge, Inc.
- Prabhuu Sinha, Satyam Computer Services Ltd.
- Bob Thorman, L-3 Communications Integrated Systems
- Joe Youmans, Youmans Consulting

Others who contributed position papers for the workshop include:

- Ruth Berggren, Electronic Data Systems (EDS)

- Douglas A. Ebert, McKesson Corporation

- Mutsumi Komuro & Fumihiro Tsunoda, Hitachi Software Engineering Co., Ltd.

- Don O' Neill, Don O' Neill Consulting

Those interested in the workshop topic, whether or not they were able to attend the workshop, were invited to submit position papers, which are summarized in Section 2 of this report. Issues, whether benefits or barriers to CMMI adoption, were loosely grouped into 13 categories, and the workshop participants multi-voted on the importance of the categories prior to arriving in Pittsburgh (multi-vote totals are shown in parentheses after topic title):

- Emphasis on Systems Engineering (16)

- CMMI Transition (10)

- Expanded Coverage (9)

- Representations (8)

- Emphasis on Product Lifecycle (6)

- Assessments (6)

- Lack of Data (5)

- Investment/Cost (4)

- Terminology (3)

- Limited Coverage (1)

- Training (1)

- CMMI Intended for Large Organizations (0)

- CMMI Business Results (0)

The process followed during the workshop was to discuss topics by category, as ordered by multi-vote importance. Using the topics to spark discussion, each participant, selected in random order, identified their most important issue regarding CMMI adoption within a category. Three rounds of brainstorming per topic identified a number of issues, which were captured on flip charts. A participant was allocated two minutes to discuss an issue. After the third round of brainstorming, a group discussion elaborated on the issues within the category. The results of brainstorming and the discussion are captured in the tables throughout Section 3 of this report. Participants then multi-voted on the most important issues within the category.

After brainstorming through all 13 categories, the issues identified were ordered by their multi-votes within each category, and another multi-vote was held across all categories. This ordered list is in Section 4. The ordered list of issues was then used as a basis for further discussion and recommendations, as contained in Section 5.

2 Position Paper Topics

All workshop participants submitted position papers related to the purpose of the workshop. Issues identified in these position papers, whether benefits or barriers to CMMI adoption, were loosely grouped into 13 categories in Table 1. The topic category is stated in column one, "Category." Column two, "Issue as Identified in Position Papers," contains summary statements of the issues (as identified in the position papers).

Table 1: Position Paper Topics

Category	Issues as Identified in Position Papers
1. Emphasis on Systems Engineering	a) With appropriate interpretation, CMMI provides a significant benefit to information technology and information systems (IT/IS) organizations by focusing attention on the "systems" aspect of IT application portfolios and technical environments.
	b) Many of our projects are software-only projects and references to systems engineering are felt to be largely irrelevant to them.
	c) Many of our projects involve significant hardware issues and can benefit from a more rigorous look at systems engineering practices.
2. Emphasis on Product Lifecycle	a) CMMI can be interpreted to focus on new product development, where most IT/IS organization workloads are based on existing product enhancement/maintenance, causing resistance to usage of the model as a tool in process improvement.
	b) CMMI addresses the full life cycle of the product, which benefits both commercial software and IT/IS organizations by helping them to manage application portfolios across a long period of time.
3. Terminology	a) CMMI uses systems engineering terminology that is unfamiliar to typical IT/IS personnel, leading to resistance to use and slower realization of value.
	b) Changes in terminology are not supported by CMMI transition material.

Category	Issues as Identified in Position Papers
4. Expanded Coverage	a) CMMI addresses business value and stakeholder involvement, critical issues for commercial software organizations that have unclear "customers," and IT/IS organizations where involvement of stakeholders is not typically done in an effective manner.
	b) There are too many process areas (PAs) in CMMI, which results in overlap and cumbersome assessments.
	c) The new model, besides its huge size, has complicated architecture and representations.
	d) Many groups within our organization have resisted using any external process model; the depth and complexity of CMMI causes even more resistance from these groups.
	e) CMMI is an improvement over the Software CMM for organizations that acquire and use COTS and are responsible for acquiring and using system software and hardware.
	f) The CMMI model lays greater emphasis on the engineering activities and how a project is done.
	g) CMMI has a new PA, Measurement and Analysis at Level 2, which details the measurement objectives, practices, and results of a project and aligns them to the organization's needs. The move toward having an integrated measurement system that meets management information systems (MIS) needs at Level 2 forces early focus on the business case, which is very necessary, but was omitted in the Software CMM.
	h) Decision Analysis and Resolution (DAR) is a new PA that discusses structured decision making using established criteria and appropriate situations for the same.
	i) Risk Management (RSKM) is addressed as a separate PA, while it was included in the Integrated Software Management key PA (KPA) in the Software CMM.
	j) Software Product Engineering (SPE) in the Software CMM has been split into Requirements Development (RD), Technical Solution (TS), Product Integration (PI), Validation (VAL), and Verification (VER). Verification also covers the peer reviews KPA in the Software CMM.
	k) Product evaluation criteria are explicitly specified in the Process and Product Quality Assurance (PPQA) PA, which was missing in the Software CMM.

Category	Issues as Identified in Position Papers
	l) There seem to be some PAs not too relevant for software development, at least in our company. (Decision Analysis and Resolution [DAR] and Product Integration [PI])
	m) The CMMI Framework is too large to easily understand and SCAMPI^{SM} assessments take a long time.
	n) CMMI addresses a number of issues that the CMM, when applied literally, misses.
	o) All of the practices in CMMI appear to be good ideas that an organization can use as the foundation for an improvement program.
5. Limited Coverage	a) CMMI does not address very well IT governance from the perspective of the Board of Directors, thereby making it difficult to sell the use of CMMI to the CEO for company-wide use.
	b) CMMI does not contain an IT security management component, thereby making it difficult to use in IT security planning and auditing, which are significant issues especially in relation to the use of commercial software products.
	c) CMMI is mainly applicable and advantageous where a number of groups are involved in the development. It may be of particular use in large projects which involve multi-disciplinary teams working together.
	d) Not all "pre-project activities" are included in PAs.
	e) Guidance has not been provided to allow adaptation of CMMI to software-only organizations.
6. Lack of Data	a) Case study data from early adopters of CMMI is not documented and made available as it is for the Software CMM.
	b) A lack of clear "cost of ownership" for adopting CMMI software process improvement efforts leads to wholly unrealistic expectations from senior staff.
	c) Data regarding the return on investment (ROI) and other gains and benefits experienced by organizations engaged in system integration and following a CMMI model are not available.
	d) ROI data from CMMI use has not been yet validated whereas the Software CMM has a proven track record.

Category	Issues as Identified in Position Papers
7. CMMI Intended for Large Organizations	a) CMMI gives the impression of being only applicable to large organizations that are capable of making an up-front, sizeable, long-term investment.
8. Training	a) A lack of good "getting started" training classes hinders early adopters—especially those with a limited formal Software CMM or SE-CMM background**.**
9. CMMI Business Results	a) CMMI does not include any critical business success areas (versus management and technical areas).
10. Representations	a) Due to the continuous representation, CMMI is more amenable to incremental implementation.
	b) The CMMI continuous representation is ambiguous in the definition of certain PAs and the assignment of capability levels (CLs) to those PAs.
	c) The two CMMI representations (staged and continuous) make it difficult to compare different organizations with respect to their process improvement accomplishments.
	d) CMMI can be implemented using a process capability approach (continuous model) or an organizational maturity level approach (staged model). Organizations opting for CMMI with no history of the Software CMM may prefer to implement the continuous model since it enables them to work on their selected focus areas.
	e) The dual representations of CMMI, combined to the progressive and rapid inclusion of several disciplines, makes it very challenging for organizations using CMMI (as "users" or as "consultants") to catch on easily, leading to a tendency to slow down, have more anxiety, and negative perceptions.
	f) Anything that shifts the focus from maturity level scores to true process maturity is positive.
	g) The CMMI continuous representation facilitates relating process improvement efforts to the business objectives of commercial market-driven companies.
11. CMMI Transition	a) Transition from the Software CMM to CMMI may not be relevant for parts of the organization that are primarily involved in maintenance of software or small development projects.
	b) The current (i.e., based on the Software CMM) processes work well and benefits from them are evident.

Category	Issues as Identified in Position Papers
	c) The transition path for companies moving from the Software CMM to CMMI is not clear. Approaches along with tools and training to achieve the transition are not evident.
	d) Although the ultimate goal of achieving more business at a profit is the same for market- and contract-driven companies, achieving "certified" Software CMM and CMMI goals can be more directly tied to qualifying for and winning Department of Defense (DoD) sponsored contracts in the contract-driven world.
	e) The overall business profile of our company has remained the same and guidance provided by the Software CMM is adequate.
	f) Our organization has also adopted the P-CMM (People CMM). A number of requirements of CMMI (e.g. Integrated Teaming and Organization Environment for Integration), which are not addressed by the Software CMM, have been taken care of by the P-CMM.
	g) CMMI being published in English only makes its adoption challenging for countries where English is not the first language. Even when the organizational policy (in multi-national corporations) is to adopt English, in the trenches, where resistance to change is the most prone to develop, people do not necessarily speak English fluently enough to thoroughly understand the model.
	h) Without proper project management, the complexity of a CMMI process improvement program will generate confusion and rebellion (pillars of wisdom).
	i) Higher maturity practices of the Software CMM provide a process improvement program for CMMI. (Crawl before you walk.)
	j) We have found that providing the process elements, within the proper ownership structure, naturally creates participation. Senior management leadership of the process improvement program and the policy architecture to communicate expectations led by CMMI-based services is the mutually beneficial way toward enterprise participation.
	k) The CMMI initiative is software driven (e.g. SEI & ownership issue).
	l) There is no market pressure on our company to implement CMMI.

Category	Issues as Identified in Position Papers
	m) When users actually use CMMI to concretely deploy integrated software/systems engineering practices for a sustained period of time, the barrier between the software and system communities will progressively fall.
12. Assessments	a) The SCAMPI (1.02) assessment is not a burden for the assessed projects.
	b) The fact that SCAMPI 1.1 uses process improvement indicators (PIIs) and that SCAMPI is now being used for BOTH **internal** (like a CMM-Based Assessment for Internal Process Improvement [CBA IPI]) and **external** (like a Software Capability Evaluation [SCE^{SM}]) goals, it will be particularly challenging to maintain the motivation among the CMMI community to pursue continuous internal process improvement. There is a serious risk of falling in the "minimal conformity" paradigm (i.e., the "legalistic" approach).
	c) The lack of an incremental transition path from the Software CMM and CBA IPI to the CMMI and SCAMPI is a barrier to acceptance and incorporation of CMMI, especially by the commercial business community.
	d) A recognized and established mechanism for assessing incremental progress using a CMMI model with a continuous representation will facilitate CMMI model use in commercial businesses.
13. Investment/Cost	a) Excessive fees for lead assessor licensing and fees have significant impact on an enterprise of our size. The five-year fee structure for conducting CMMI assessments across our organization will approach $350,000. This is significantly higher by hundreds of thousands of dollars than for support of Software CMM assessments.
	b) A corporate license or fee limit that would cap annual costs for *Introduction to CMMI* for assessment teams, annual renewals, royalties, and observations would enable us to continue to perform SCAMPI assessments.
	c) Investment has been made in adopting the Software CMM model and a mechanism for maintaining the same exists. An additional investment will be required for the transition, but the added value of that transition may not be commensurate with the investment.
	d) Sunsetting of the Software CMM does not address the needs of those organizations for which making the transition to CMMI would be costly and complex.

Category	Issues as Identified in Position Papers
	e) CMMI initiatives are viewed as rework (i.e., don't pay for the same real-estate twice).
	f) It is not clear that investments made in the Software CMM over the past few years are preserved in moving to CMMI.

3 Brainstorming CMMI Adoption Issues

The issues identified in the following sections were captured on flip charts during workshop sessions. The flip charts are reproduced here with only very minor changes to ensure the integrity of the information is preserved. At the end of each session, which covered a particular issue category, participants were asked to vote on the most important issues. These votes are captured and represented in the left column of each table.

Before the brainstorming activities, the participants were first asked if they had made a decision to adopt CMMI. A "yes" answer indicates that the participant's organization has decided to adopt CMMI. A "no" answer indicates that the participant's organization has not yet made a decision or has decided not to adopt CMMI at this time. Table 2 contains each participant's response to the yes/no question and the rationale behind their organization's current position.

Table 2:   Decision to Adopt CMMI

Decision to Adopt CMMI
Yes. Level 3, SW-CMM proved useful inside the company, but work with many systems engineering, COTS, systems integration companies—getting ready for class C assessments.
No. Not clear what the benefits are. 100 internal organizations, software-only organizations. Systems engineering is not applicable. Mainframe COBOL. SW-CMM works, better performance out of IT organizations. Big investment in SW-CMM, perceived loss of initial investment. Why? Still making progress.
Yes. Class C SCAMPI. CMMI lots of lift. Primarily a systems integrator, huge benefit because of integrated approach. World picture, rework problem, selling is no problem. Implementation and deployment is a challenge.
No. Our target is the same. Have ISO. What is wrong with SW-CMM? Why can we not continue? Sunsetting put pressure to re-evaluate. Difficulty seeing benefit with CMMI. Talked to customers. Cost is high going to CMMI. Will not move even if SW-CMM sunset.
No. CMMI is not on our short list. ISO 9000, SW-CMM, and e-Services Capability Model are. Within our company: (1) Government contracting organizations have adopted CMMI, consistent with what they already do, no big leap. (2) Outsourcing groups—no benefit, does not meet our priorities. Change was from walking to driving a car when going to SW-CMM. With CMMI, it is just another car.
Yes. 1. Realized that sponsors usually want to have benefits spread across the organizations. 2. Realized there were activities not covered with SW-CMM. 3. Needed evolution of best practices. 4. Our company is involved with ISO 15504, and CMMI is aligned.

No. One government agency will use SW-CMM regardless of sunsetting, accept staged framework of CMMI for other organizations. Success of SW-CMM is quite visible, little motivation to retire something that works. CMMI—implement one PA is a benefit, but can you really do this?
Yes. We believe in process improvement. CMMI is an evolved model that addresses many issues (terminology, scope, and focus on an area). Customer perspective—glass is ½ empty, glass is ½ full. We can use CMMI to bring other parts of the organization that can benefit— other side is that their investment in SW-CMM will be lost.
Deal with small, market-driven companies trying to figure out a way to do the transition without a lot of cost.
Not a clear-cut yes or no. We have adopted Software CMM and People CMM. CMMI has pockets of use in our organization. Do we have to take the whole organization to CMMI? Even where it doesn't apply? This approach won't work for us. Investment is a concern, we have already built an infrastructure for supporting Software CMM—so we need not adopt CMMI for the whole organization, but will pilot it where it fits, to determine the benefits.

3.1 Emphasis on Systems Engineering

Table 3 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Emphasis on Systems Engineering." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 3   Emphasis on Systems Engineering

Votes	Issues
Brainstorming	
10	For software-only, how do you interpret CMMI <u>consistently</u>, if tailoring is left to individuals? Wrong approach—need tailoring guidelines.
	Barriers between software and systems engineering will never fall, but will eliminate cultural no-no's. REQM, RD, VER, and VAL help to fix problems.
	Migration from SW-CMM to CMMI may not be worth the cost, especially software-only, when you are seeing benefit from SW-CMM. First step to SW-CMM—large delta. SW-CMM → CMMI—small/unknown delta.
1	Involvement with systems engineering good, <u>but</u> how do you transition a mature software group and an immature systems engineering group without burdening the software group?

Votes	Issues
2	People in CMMI classes are coming from both communities—there is no such thing as a software-only project.
4	Expand on previous point. We don't teach our software folks to look at systems engineering issues. However, our systems and environments are more complex.
1	What can be developed versus what can be implemented, interpretation is an issue. What do I gain from re-interpreting this thing? The population is young (2-4 years). Large systems perspective is difficult at this level.
6	CMMI more holistic approach—1) huge culture change 2) transition—not having proper roadmap 3) roadmap 4) leverage investment → solve and adoption will occur.
9	Agree with software-only. However, emphasis—only so many improvement dollars, coordination, painful tasks are covered by SW-CMM, (IC covers systems engineering issues in SW-CMM). Don't own systems people, only software. Interpret CMMI for software.
	Some PAs, e.g., Competency Integration of People CMM, have a different name but are covered in CMMI. Due to our People CMM initiative, this is already done and does not require additional effort in transition.
	When systems engineering is outsourced—providing guidance is desirable (how to interpret CMMI).
12	Not just method issue but also model. Continued maintenance of SW-CMM (CMM V2) for organizations that are predominately software.
1	When applying this to airplanes, CMMI provides the robustness.
6	SW-CMM might be adequate instead of adopting CMMI. CMMI is not irrelevant. Building on systems engineering aspects. More than 90% of organization would need SW-CMM, some of the requirements that CMMI provides already addressed.
10	Clients struggle for perfect answer. Shift focus from satisfying the model to using the model to identify and address problems in the organization. Extremely useful to have implementation guides. (Internal IT departments.) Size doesn't matter; issues are the same.
5	Need guidance for defining organization types, need to think about different flavors.
1	CMMI represents a framework, and you can apply some part of it. You don't need to apply all of it.
	Good source book. The issue is complexity. When you want to focus on software, there are a lot of things to think about: continuous/staged, which PA…

Votes	Issues
Discussion	
1	There are only a few exceptions where you wouldn't use certain specific practices if you are a software company. There are amplifications—might need a global guidance book.
	Appears there is an evolutionary step between SW-CMM and CMMI with this interpretation guide.
3	Investment in SW-CMM is reusable in CMMI (think about discussions of maturity levels [MLs] - score is important). This is not a technical issue but more of a selling issue.
	Understand the benefit of CMMI. The difference between SW-CMM and CMMI is not that big.
	What is the benefit versus implication of deploying a new model in the organization?
3	Coming full circle that software is important, but now saying systems engineering is the most important thing. May be unnecessarily distracted.
	Don't engineer software, and we keep adding more and more scope, but will we lose what is important?
2	CMMI first comprehensive business model that links various aspects of business.
3	More comprehensive view—so how do you implement this in various levels of your organization?
	Without CMMI you will have a single vertical view.
	We are shaping the future (spin doctors). Looking at this holistically does not water down.
	Are we looking for something <u>different</u> to keep this competitive advantage?
	Since 9/11, security is a big issue—this is an evolving process.
	Embedded systems and COTS are more complex today—so we need to change.

3.2 CMMI Transition

Table 4 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "CMMI Transition." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 4   CMMI Transition

Votes	Issues
Brainstorming	
1	Many projects are maintenance projects, and they think that much of "this stuff" doesn't apply—Implementation guides could describe what applies. Things are not applicable or partially applicable—[e.g.,] TS, even if architecture exists, need to evaluate it to make sure it will meet what you need.
1	Keeping a process focus is a project management challenge. Needs to be addressed by training or model. Using CMMI in your process improvement approach is a <u>huge</u> effort.
	What is meant by transition? • SW-CMM $\Rightarrow$ CMMI • [newbie or other model] $\Rightarrow$ CMMI SW-CMM $\Rightarrow$ CMMI—chasing a level number. How will CMMI be written into contract language? Contract language is a big item.
	Wherever CMMI is relevant, it can be included in the quality management system (QMS). That's not a problem. But for others, where things are working well in the framework of Software CMM, we will end up having non-applicable PAs in trying to use CMMI.
9	Not having a roadmap. 1) Do I make continuous or staged choice? What is applicable, what is not? 2) Scale. There is much <u>more</u> in a shorter period of time, e.g., MA. 3) Cost: what is the cost of moving from SW-CMM L3 to CMMI?
15	No compelling need. Have SW-CMM, and it is working, and you can't take it away. Worst case: have to develop an appraisal method.

Votes	Issues
13	Really five transitions: 1) New architecture (structure is different) 2) New software processes 3) Adding SE 4) Continuous representation 5) New assessment method If you are going for score, you have to address four transitions $\Rightarrow$ roadmap.
	Global transition issue $\Rightarrow$ language barriers.
	CMMI is a solution looking for a problem. Historically, software is a problem. Systems are failing because of software.
2	Most difficult issues transitioning from SW-CMM to CMMI. 1) Items that will not apply. 2) Subject to interpretation by assessors. 3) How quickly can someone say something does apply or doesn't apply?
	Transition from SW-CMM L2 to CMMI L2 causes an obligatory transition period because of institutionalization, deploying new processes, and new transition window. There will be a violation of contract unless there is some guidance.
2	Arguments about CMMI are similar to arguments from early SW-CMM. Cut ties to SW-CMM if you want people to transition; won't make transition as long as there is a status quo alternative.
6	We adopted ISO as it was a business need (required to do business in Europe) We found that Software CMM is a better framework in explicitly bringing out usage of data /metrics to manage. A large number of organizations adopted this. Now having a Level 5 is a differentiator in bagging assignments. When someone requires CMMI to do business, then it may be a different story. … Otherwise we need to clearly understand the benefits in transitioning to CMMI.
	It may be a good idea to use SCAMPI and see how many "not applicables" you get to see how applicable CMMI is in software-only organizations. In context of process improvement, the benefits of CMMI should be very clear. If the intention is improvement, and CMMI helps in improvement, it will be a natural tendency to move to CMMI.
1	SW-CMM is at the core of the CMMI Product Suite. You aren't starting over. The high maturity practices in SW-CMM help you with CMMI. This is not all rework, and people need to understand that.

Votes	Issues
12	Believe CMMI is international, and there are some barriers. Concerned about strategy adopted [by SEI] that this is a barrier. The additional 50% added-on price, location barrier—Enormous cost and energy. People from other countries are investing a lot of time and money—need more balanced solution.
4	Commercial community is less contract driven and more market driven. Process improvement associated with (driven by) business goals is better. So exploit continuous representation.
3	This is not evolutionary change but rather revolutionary change—SW-CMM v2C—saw what was going on. With CMMI—new complexity. SW-CMM lighter in complexity. Where do I get started in CMMI?
2	Objective of this transition. For the purpose of improvement, do I always have to change model? If process improvement (L5) looks for and addresses opportunity, will your own processes address these ever changing conditions? Every transition should be viewed as a process improvement transition that adds value to customer.
8	CMMI very expensive to adopt because expensive for consultants to be "authorized" ~ $40K+, 6K royalties per year. Bigger companies will serve this market, and it will be more expensive. Compared to ISO 5x to 8x more expensive.
Discussion	
	Different types of companies: 1) commercial—self-motivation 2) defense—business drivers/policy, client driven 3) consulting—business drivers, client driven
	Transition from ISO wasn't really a problem (incremental).
	Transition to CMMI many different things.
	CMMI being forced in a short period rather than long (analogy $\Rightarrow$ Windows). CMMI is more on an evolutionary path than revolutionary path.
	It is a major change.
	Reacting strongly as change agents as changes are happening to us.
	For companies implementing nothing, SW-CMM is a path of compliance for CMMI. But you could get the partial credit.

1	Business drivers are critical. What is the value proposition?
	
	  - SW-CMM—quality
	  - CMMI –adoption of systems engineering discipline in areas like COTS

	Less expensive assessment alternatives needed

3.3 Expanded Coverage

Table 5 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Expanded Coverage." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 5   Expanded Coverage

Votes	Issues
Brainstorming	
1	SCAMPI appears to be very labor intensive, consumes calendar time, staff hours.
2	Yes, bigger but areas that were open issues in SW-CMM. But needs to be applied carefully.
6	Too many PAs and some of the wrong kind, e.g. DAR. More PAs isn't necessarily bad but we need more of the right thing. Examples: What do our auditors look for? Many use COBIT. We needed a security management model and did not find security content in the CMMI. Therefore, we had to go outside the model and choose ISO 17799. Bottom line: CMMI needs well-defined criteria and guidelines that drive the content and expansion of PAs.
5	DAR, TS for example. Expansion was difficult to apply in maintenance environment.
1	Need this expansion on SPE [from SW-CMM].
	The expansion of SPE is relevant in a development environment; however it is not so critical in maintenance environment. In a development environment: these processes are already expanded in all probability. (Comments already provided in position papers.)
6	Measurement and Analysis (MA) is good with expanding business imperatives—this needs to be emphasized and expanded even more.

Votes	Issues
4	Explore expanded coverage assessment (delta assessment that only looks at what is new).
	Expansion welcomed, [but] when you don't have choice to adopt, there is an investment required that imposes additional overhead on the company.
3	Give guidance in partitioning systems engineering and software capability so that if you only want to focus on a particular subset you can.
7	Clearly see why model needs to be integrated, but who is helped and who is hurt? Only auditor is helped; everyone else is hurt. Disservice to the rest of organization who usually does a specific task.
1	Process asset ownership is much different in CMMI.
1	SPE is an improvement to split it out [into multiple PAs].
4	New approach with process [practice] indicators isn't as cumbersome. It should help to gain significant time during the onsite period
8	Greatest shortcoming of SW-CMM is that it was implemented literally—not clear that this doesn't get worse in CMMI.
5	Requires a higher level of sponsorship.
Discussion	
8	[I thought] SEI would put all of their models into one structure; instead SEI "mushed" all of their models together, now more painful.
1	This thing is SO BIG, impression is that you have to do it all, and you have to do it all right now! Must plan strategy more carefully.
	[The original plan was that] CMMI [would be a] repository of components, and you could select a button to get what is needed. Since the organizations have to make the button decision themselves, then there will be different interpretations. Consistency of assessments is a concern.
	Big bulk of world is using CMMs as yardstick.
	Capability is a range or results, not a prefect predictor.
	How did they (ISO) handle the expanded coverage—it was more evolutionary. No change in architecture, based on industry need.

Votes	Issues
	One or two people asked for CMMI, now the masses are expected to have this need.
3	If I only assess 80% and say I'm CMMI-compliant, then I'm leaving out critical information, not truthful to customer.
	If you win lottery and start company where solutions are based on software, what would you pick? CMMI.
	If you bought an [existing] company [that didn't have serious systems issues], would your answer be the same? Yes.
	CMMI manages the business better.
	[CMMI is] about risk reduction/migration so that you can reduce risks to customer.
	Tradeoff will increase cost.
1	Implied expansion of support within companies and model requires expanded support by industry/SEI. What is being done to help this transition?
7	SW-CMM in place takes care of a large number of issues, except customer satisfaction and complaints, and this helped with transition from ISO 9001:1994 to ISO 9001:2000.
	ISO same body doing certification, but training is what changed, therefore no major change/impact.
	When does the expanded coverage stop? It's just getting started (business opportunities, customer satisfaction). Concerned that this is just the beginning.
	Things that are tolerable now will be intolerable in the future.
	"Glass ceiling" if things keep being added—too large, too complex.
	World works with having a "grade."
	Is security a product-focus attribute? • You need to ensure that this needs to be done. • Central component of software development.
4	Criteria for expansion are needed.
	To date, CMMI is DoD driven. CMMI now needs to address the needs of commercial companies, e.g., business goals and security.
2	What needs to be added from commercial world?

3.4 Representations

Table 6 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Representations." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 6   Representations

Votes	Issues
Brainstorming	
	Took quite a while to understand the two different structures. Once understood, it still would be tough to explain. Should it be staged, continuous, or both? Good idea, but hard to decide which representation. Our company eliminated this by picking staged and going with it.
12	Shift focus from score to process capability is <u>good</u>.
3	"Constageduous" approach is key. Both visions are good, but do we need both representations?
	Easier to engage folks in process improvement with a Level 1 available (continuous CL1).
	Integrated <u>representation</u> only supports the needs of a very small percentage of the organization. As model gets larger, this percentage will get smaller.

1
 	
2
	Continuous representation is ambiguous
	
	1) You can't look at PAs independently.
	   • Requirements Development and (RD) Requirements Management (REQM)
	   • Measurement and Analysis (MA)
	   • Project Monitoring and Control (PMC) and Project Planning (PP)
	2) Not enough elaborations, work products, and examples to show what it means to go up a CL. What is CL4 & CL5?
	3) Taking PAs and matching them to CLs doesn't make sense—CL4 on Quantitative Project Management (QPM) and MA.
	4) Doesn't help with meeting business objectives.

	Still confused about continuous representation. Must be skilled in both to understand both representations, and this might be impossible to do. Build expertise—want lead appraiser (LA) that is skilled in one representation rather than both.

Votes	Issues
3	SEI needs to look into other views into models, e.g., role based. Keep the staged representation. *[The following text was added after workshop]* *For example, you can define a view (via matrix, table, etc.) that shows what parts of the CMMI are applicable to you if you were a programmer, a view for development project lead, etc. These views would not require a separate physical document as is the case with the Continuous Representation. There is already some commercially available software that incorporates role views in helping companies develop documentation for CMM compliance. That indicates the need in the marketplace for those types of views into the model.*
5	The first indication that there was a problem with representations was when someone uttered "constageduous."
1	Maybe we can get by with one representation. If we had guidance on how to get to the other. Do we need two auditing approaches?
7	From implementation perspective, which representation gets you results faster (ROI data)?
8	Easier to propose, manage, reward process-improvement efforts if you can align progress with PAs. - Easier to engage middle management if you align their processes with smaller increments instead of a 1-2 year timeframe (MLs).
	Doesn't seem that there are any quality checks to ensure that SCAMPI is done properly (same issue with CBA IPI).

Votes	Issues
15	Keep simple; kill continuous representation.
	[*The following text was added after the workshop.*]
	Why does our company want to kill the Continuous Representation (CR) when no one is forcing us to choose it? Why not choose the Staged [Representation] for our company and let others choose the Continuous Representation? Our answer to those questions:
	1. *Opportunity Costs: Even though v1.1 of the CR has been published, there will be ongoing work required by the SEI to handle change requests for the CR, to teach classes in the CR, and to add more detail to the CR (in terms of elaboration, examples, and typical work products) to show what the higher Capability Levels (CLs) really mean for certain Process Areas (PAs). Realizing that the SEI does not have unlimited funding, all of this effort could be better spent, in our opinion, in investigating, incorporating, and maintaining other model content (e.g. security, business objectives, tailoring guidelines) into the Staged Representation of the CMMI.*
	2. *Complexity: By having a separate physical document for the CR with the same thickness (and actually more goals) than the staged, the perception in the marketplace is that CMMI is overly complex. Even though organizations can choose a representation, they still need to study both to determine which one is best for them. This will lead organizations, especially those in which agile processes are used, to choose other less complex and less voluminous process models. The end result, in our opinion, is that the CMMI will lose market share. We would not like to see that happen since the CMM, especially Level 2-3 KPAs, has proven its value to us over and over again. Also, as a company seeking a competitive edge, we would like to go with a model that is the leader in market share and recognized by most of our clients.*
	3. *Unnecessary: The ability to pick and choose PAs individually is already available in the Staged Representation and has been since the CMM. The advantage of choosing them individually from the CMMI Staged Representation and not from the CR is that you can see what each PA is based upon. This makes it easier to determine what else you should be doing while trying to implement a specific PA, i.e. you should be doing related PAs and those at lower maturity levels.*
3	With staged, less possibility of rewarding people (heard but disagree), but encourage other indicators like goal achievement. Have to establish monitoring approach for staged. Don't encourage people to gauge progress against staged.
8	Provides opportunity to acknowledge that some PAs change as they mature.

Votes	Issues

	[The following text was added after the workshop.]
	
	Deficiencies in the representation that could be resolved by either updating the Continuous Representation with clarification OR by killing the Continuous Representation.
	
	1. *The Continuous Representation assumes dependencies that are not shown by representation of standalone PAs going from CL0-5. For example:*
	
	   • *Cannot do Requirements Development without Requirements Management.*
	   • *Cannot do Measurement and Analysis in a vacuum.*
	   • *Cannot do Project Monitoring and Control without doing Project Planning.*
	
	   While the Continuous Representation text describes some of these dependencies, the Continuous Representation diagram does not support these dependencies.
	
	2. *The Continuous Representation often does not give enough detail and examples about what the higher-level CLs would look like for a given PA. The following is just one of many examples: Project Planning is a Maturity Level (ML) 2 PA in the Staged Representation. In the Staged Representation, there are elaboration, examples, and typical work products for the Specific Practices (SPs) and the Generic Practices (GPs). However, in the Continuous Representation, the elaboration, examples, and typical work products stop with GP2. In other words, the Continuous Representation does not contain any elaboration, examples, and typical work products beyond what was already in the Staged Representation. (This appears to be true for all PAs in the Continuous Representation.) Therefore, if one wants to know what the Project Planning PA would look like at CL3-5, no detail is available other than reading the generic descriptions applicable to all PAs.*
	
	Certain CLs for some PAs do not appear logical. For example, what does a CL4 (Quantitatively Managed) mean for the Quantitative Project Management (QPM) PA? If an organization is doing QPM at all, wouldn't it already be at CL4?

Discussion	
	When teaching, people do understand the differences between the two representations.
	Allows flexibility.
	Companies who adopted SW-CMM could use it any way they see fit. Therefore, no need for two representations.
	Industry loses nothing by just having staged. Multiple representations add nothing except complexity.

Votes	Issues
	Advantage of picking and choosing in staged, lets you understand the prerequisite PAs.
	Minimizes overhead for SEI, company, etc.
	Difference between two representations is minor (look at pages in books).
1	Tend to forget about ISO 15504, which requires a continuous representation.
	Have a preference, but is it up to someone to select?
	Failure rate of SW-CMM is greater than success rate and companies do not believe they can pick or choose.
2	Money spent on two representations could have been used on SW-CMM v2.
	MLs misused; continuous representation will encourage organizations.
8	Preference is **A** representation.
	Test is a motivator and comparative yardstick. There is a place in the community for the test.
	Conformance with business practices myth that you do process improvement for process improvement sake. Process improvement models are used for business drivers, and you need to find the quickest way to recover these dollars.

3.5   Emphasis on Product Life Cycle

Table 7 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Emphasis on Product Life Cycle." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 7   Emphasis on Product Life Cycle

Votes	Issues
Brainstorming	
8	Interpreting for maintenance environment is difficult
4	CMMI is <u>not</u> only applicable to development, <u>AND</u> it addresses the full lifecycle, and this is a good thing. We do a lot of work maintaining code written by someone else, and CMMI helps.
	Haven't heard of big product companies using CMMI. Many of requirements are non-applicable.
5	Product development is one of the areas where there is the most change. Process Areas like Technical Solutions, Product Integration, Decision Analysis and Resolution, Integrated Teaming, and Organization Environment for Integration would find maximum applicability in the context of product development. Hence, need to do pilots to see results.
	[To quote George Box,] CMMI is wrong but is very useful; judgment is required. Could be "overkill" in detail.
1	Most people in SW-CMM were familiar with software, now there is an increased likelihood that we won't understand material—examples are needed more than ever in CMMI.
5	The CMMI addresses full life cycle of the product, which benefits both commercial software and IT/IS organizations by helping them to manage application portfolios across a long period of time.
8	Literal interpretation of SW-CMM was an issue. Literal interpretation of CMMI is an issue. See issue a: The CMMI can be interpreted to focus on new product development, where most IT/IS organization workloads are based on existing product enhancement/maintenance, causing resistance to usage of the model as a tool in process improvement.
Discussion	
	We don't do new products, so how do you interpret this practice.
	Lip service about <u>full</u> lifecycle, cradle-to-grave, still emphasizes development.
	Make/buy/reuse, evaluating alternatives, TS too much to ask when doing a 40-hour fix. Okay, [they're] not applicable. How do I interpret this? Not do practice, do something else, or …
	There is an extreme—either literal interpretation or do nothing.

Votes	Issues
	The way that organizations define and treat what is a product and what is a project is different in this workshop.
	Sketchy product life cycle: - not applicable - consider project full life cycle
	Example of a layered situation.
	What is the "world" of the typical user of CMMI—what does it look like?
8	Need tailoring guidelines and examples—not just saying it is non-applicable. For example, how do you tailor the PAs if you have COTS, are doing maintenance and not new development, etc.?
	Identify types of work: - new development - adding pieces (project) - quarterly release - smaller than projects - patches - infrastructure projects - engineering projects (e.g., database systems, new operating systems)

3.6 Assessments

Table 8 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Assessments." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 8   Assessments

Votes	Issues
4	More complex because of scale of model, not method, cost of assessments concern. Having one method is good.
7	Partitioning of appraisals, more alternative appraisal methods to assist with transition. (Another participant states common appraisal framework [CAF] allows this.)
1	One of the reasons we got away from continuous—difficulty in assessing it and then communicating results.

Votes	Issues
10	Due to the expanded scope, demands other approaches for doing appraisals. • delta appraisals • multi-phase appraisals • surveillance appraisals
7	SCAMPI v1.1 has process improvement indicators (PIIs) to help reduce burden of collecting info. SCAMPI V1.1 is very different from version 1.0 (which was almost identical to CBA IPI). Comfortable to do ten-day assessment on all areas (think organization is ML5); targeting 100 hours. Price to pay is to go to verification approach that is close to an audit approach. Before we get on site, the organization has to fill out several PII forms (significant internal effort prior to onsite).
8	Skill issue, so much content in model (systems engineering and software, staged and continuous, IPPD). This seems like a whole lot of material for the lead appraiser to know.
	Cost, some of the cost burden is moving within the organization, and now because of PIIs may spend two days where we spent four hours.
6	Training of LAs and quality issues. Greater understanding of model and greater control of quality, which will cost more.
	Approach and needs of a low maturity organization may be less than those of a high maturity organization.
2	Not clear that an appraisal done in verification mode meets the objective of the diagnosis mode of the IDEAL^{SM} model. Especially true in low maturity organizations.
6	Strongly support delta appraisals. • PIIs were created on wall charts during on-site period, now they are done beforehand. • On-site period kept to ≤ 100 hours. • Every time you do an appraisal start from scratch $\rightarrow$ SCAMPI addresses this a bit with PIIs. • Learn how to use SCAMPI for process improvement.
	Large part of success of SW-CMM was due to level numbers in procurement language. People often adopt things for the wrong reasons, but are glad that they got to this new state.
1	Support level number, many of the internal initiatives we started to calibrate to Levels 1-5.
	Write procurement language without level numbers.

---

^{SM} IDEAL is a service mark of Carnegie Mellon University.

Votes	Issues
5	Budget burn rate issue—a little now, a little later. No guidelines for stretching/interpreting assessment requirements for CMMI (ARC).
3	SCAMPI does not provide a sampling method (failure), we just say go sample.

3.7 Lack of Data

Table 9 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Lack of Data." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 9   Lack of Data

Votes	Issues
Brainstorming	
5	Collect data on those assessed using continuous representation.
	Not clear if investment in SW-CMM is preserved and then enhanced.
2	Nice to have more granular data e.g., particularly regarding ROI continuous/staged, L2 / L3 / …,
6	Business decision—Do we want to spend money on SW-CMM or CMMI? ROI data on both SW-CMM and CMMI (comparison).
2	Wealth of data for L4 organizations. Show delta between SW-CMM and CMMI. Data should be available; actively solicit.
	Not aware of data available, gain of going from SW-CMM to CMMI. Sensitive to the maturity level the organization is at when transitioning to CMMI—and what is the "dip." Data where systems perspective is strong versus other companies where systems are weak. Comparability when parts of CMMI are non-applicable (ROI).
1	Validation is a key issue when reporting ROI. Guidelines are needed for reporting ROI—not comparable and often times not valid.
	Unfair to expect data today, but need to put infrastructure in place to begin to collect data. (My expectations are currently low.)

Votes	Issues
10	Data is across the board and retrospective. Need to provide a framework for collecting and reporting data. • demographics • starting performance • type of data • what do we mean by cost/investment
2	SEIR is okay. But rather than single organization to collect. It is more important to <u>collect</u> the right data.
7	Most data will be from early adopters. More valuable to use data from subset of organization. Comparison of data is a problem—need framework. Collection of data is possible.
7	Data related to procurements would be useful. Number of procurements, types of procurements, what kind of language and where. Procurement agencies recognize value of SW-CMM; now recognize value of CMMI. To republish data on SEI website is a good thing.
2	Guidelines for measurements being reported. Measurements reported are very creative in a negative sense.
1	SCAMPI should actively solicit amount of time it takes to complete PIIs (over and above normal).
	Fear SEI uses data in a self-serving nature. 1994 report attributed to CMMI.
5	Unfair to have data, unfair to expect organizations that do not have mandate be early adopters.
2	Continuous representation lack of data regarding CLs. Need elaboration, examples, and typical work products for every PA. Need to separate material so that it is associated with specific CLs. It is a more complex approach in the continuous representation to define up-front the GGs and GPs for CL 3-5 and then repeat those in each PA without giving detail (via elaboration, examples, and typical work products) of what those GGs and GPs really mean for a given PA.
2	SW-CMM did not have other things in marketplace. Now there are CMMI and SW-CMM. Share piloting data with community. Ease of getting information from SEI. Need comparison between CMMI and SW-CMM. Different business decisions from late 1980's to now for organizations. (There is more scrutiny today.)
9	Collaborate with USC/CSE with COCOMO model for CMMI. Sometimes easier to get qualitative data from executive workshops.

Votes	Issues
1	Reinforce ROI requests are a resistance to change (when data is not available). Sometimes just arrange a meeting on the golf course. Sometimes asking for ROI when no baseline data is available is a game from senior management. We request data, what is in it for them? Be careful because you could get garbage. What data is much easier to get? Maybe "I use CMMI" is just a start. Not talking about how they use it, just a gross statement to get started—easy solution. In other words, qualitative information from early adopters is an easy solution to put in place.
10	Argument on ROI data without thinking about ROI model. Do I want to go to ML 4 & 5 in SW-CMM or do I want to go to CMMI? Business ROI model should be built to be a predictor. Common terminology and syntax.

Discussion	
	Bucket of things that get dollars • mandates • everything else → this competes against everything based on a business case
	Vast majority of business came from commercial (1990) not the DoD. Commercial companies (banking, insurance) need computers to survive. Defense contractors view this as overhead. Early adopters were commercial organizations driven by need. Defense contractors didn't come on board until the policy went into place.
	Experience was quite opposite. When there was published data, then the commercial organizations came on board. 1994 was when these companies came on board—once data was published and available.

	TR23 → CMM → CMMI
	           ↓ ↓
	      Evolutionary Revolutionary because it has a competitor:
	                              SW-CMM
	
	Need to show there is more to offer.

4	Getting data is very simple—one example, ask project leaders, "Are you glad you had QA?"
	Information passed within peers of the company carries a lot of weight.
	Question of perception. SW-CMM is a competitor of CMMI—like saying teenager competitor of adult. This is an evolutionary path. You don't have a choice to become an adult.
2	ROI data is mixed and matched and spun however they want. $15M-profit, $14M spent on CMM, now the $14M includes everything (training, executive meetings). Framework is needed.

Votes	Issues
	With SW-CMM, very few alternatives. CMM, CMMI are viewed as either/or.
	Extreme programming (XP) process improvement is out there, and it is a non-trivial paradigm. Sells extremely easily to development groups. ROI on XP vs. ROI on CMM.

	Characterize the competitors
	
	  SW-CMM CMMI
	         ↓
	    good old SW-CMM
	    upgraded to Draft C

	Expect it will be more difficult to upgrade SW-CMM v2C than to adopt CMMI.

3.8 Investment/Cost

Table 10 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Investment/Cost." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 10   Investment/Cost

Votes	Issues
Brainstorming	
4	Lower level of entry costs for assessment should be established $27-40K. Establish lower skills but be authorized—coursework leading up. ($5K to do entry level Class B assessment.)
	Real competition [is] with prescriptive methodologies like Rational Unified Process (RUP) and XP rather than CMM/CMMI.
5	Cost is too high, is ludicrous. We need quality and higher level of understanding. $15K to become CMMI Instructor + SCAMPI Lead Appraiser[SM] (LA) + travel + lost opportunities—didn't need observation. Did not pay observation cost for becoming instructor. Observation → $1500/day + travel. Business model [is needed] to show that cost is worthwhile.

[SM]   SCAMPI Lead Appraiser is a service mark of Carnegie Mellon University.

Votes	Issues
	15% royalty, fixed fee for internal. Phenomenal difference between becoming SCAMPI LA and CBA IPI LA. Need to be able to [do] most formal before doing least formal, so shouldn't offer a Class B entry and fee. Cost is high, but value is there for a consultant. Might not be true for internal use.
	I don't think it is going to cost $15K (look at supplementary chart). ISO auditor is $1500 and if TickIT—two observations and test/interview $5K. A LOT LESS—an order of magnitude less. ISO has exact same issue of consistent results.

	+ travel + [lost] opportunity costs
	
	                       USA International
	Intro to CMMI $1,500 $3,000
	Intermediate CMMI 2,500 3,750
	SCAMPI LA 4,000 6,000
	Observation* 15,000 15,000
	Instructor Training 7,500 11,000
	Observation* 4,500 4,500
	
	                  $35,000 $43,250
	Maintenance fees 6,000 9,000
	(for two years)
	                  $41,000 $52,250
	Royalties
	  Internal $125 $187.50
	  External 15% 17.5%
	
	[*The following text was added after the workshop.*]
	
	Instructor Training and Observation are optional, depending on whether the Lead Appraiser also wishes to teach CMMI courses. The requirement for SCAMPI LA observation may also be waived. The range for USA costs is therefore $29,000-$41,000, and the range for International costs is $36,750-$52,250.

	Path to consistent results is Intermediate course + observation + quality assurance program—and that may not be needed.
	Data is there, fact is there [that it is costly to move to CMMI], this is the reason for slow adoption → retraining of personnel. Major challenge. Reasoning is very difficult to justify.
	Large number of LAs (for SW-CMM in company) [~10] cannot be grandfathered any more.
8	Believe that grandfather period has been extended.
3	Difference in business model between cost for internal organization and consultant.

Votes	Issues
5	Support additional qualifications of LAs. Costs are negligible for multi-million dollar company. Can we preserve cost of SW-CMM when going to CMMI? Need to preserve the costs and have positioned the process improvement efforts in this way. This needs to be emphasized by SEI.
4	LA costs are significant. 22,000 employees in company. Authorizing people and conducting assessments is the big picture. Royalty fee is not acceptable for something that is in public domain. Can there be a <u>VOLUME</u> discount? Release in public domain and then get what we want. Don't understand why international costs are different; skills are the same.
	Additional fee is arbitrary. It was reduced by 25%, which is nice but…. Asking for a more important fee to Canadian citizen may violate the [North American] Free Trade Agreement. And even if it didn't, is this decent? Is this a good approach to spread CMMI worldwide to treat non-US citizen differently?
	Do a lot of business internationally.
2	What is the SEI business model? Cost of tools and technologies to support.
1	Framework for next 10 years. Doesn't look like there is a good handle on this.
7	Cost is an issue. SW-CMM caught up especially in India. Importance of understanding market and having policy that promotes use. Companies outside US have process-driven, quality. More and more off-shore development. Rules of game today need to be reconsidered to look at marketplace.
	$187.50 may be unrealistic based on what can be charged <u>AND</u> we are promoting knowledge. Could not present this to management because would be thrown out.
1	Generally, fee structure isn't a problem. Pay $50K for consultant to conduct assessment, so if that is what it costs me okay. Agree with internal capability versus consultant—would like to see a different model.
	Didn't pay all the fees because I traded the SEI services for fees. Paid ~ $25K US. Multiply by 1.5 for Canadian conversion. Salary conversion in Canada is not 1.5 and I really feel what it could be for the folks of India. Felt I needed the high maturity course also. HUGE amount of money—but I restate that it was WORTH the money. If we treat all citizens as world citizens (equally), I think the price is less an issue (we get what we pay for). Not fair to compare to ISO. (Look at page count [difference between ISO and CMMI].)

Votes	Issues
3	Additional tax put on foreigners is a shame, unfair competitive advantage. <u>SEI's legal advisors might have told the SEI they could</u> charge more; it does not mean they <u>must</u> charge more. Other things are put in public domain, and access is equal for all. Why not do the same with an INTERNATIONAL model? Total price tag makes it look like you start from scratch—should have provided something to show evolution.
	$10K/yr, $150/student (SW-CMM). Dropping contract because can't justify. Costs more than sending students here (SEI). 60 students required to break even.
9	Difference between developing internal and consultants. Three LAs + four candidates. Candidate lead assessors are still candidates because our company is not performing enough assessments. Because of costs, won't go to CMMI. Sponsoring candidate lead assessors is just dumb [idea] when we aren't doing enough assessments, but there is personal growth. No business case to go to SCAMPI.
1	Assume there is a business model that targets how many people we want to move to CMMI and then do we have the resources to train the target. 40 Intro to CMMI [transition partners], 4X SW-CMM.
	Demand for SCAMPI is zero because only have early adopters.
	Blind numbers in the abstract. Costs look like not enough or too much. The individual cost/engineer to process improvement should be X. SEI needs a flow of revenue to continue this program. Cost of CMMI, no different than cost of using CMM.
	Is this a worthy investment? In a $3 billion program this is a worthy investment. Investment is well worthwhile.
2	Unfair advantage is incorrect because of the federal taxes that US organizations pay to do business.
	Understand difference between the US and those who deal with the government.
	• Government agencies aren't willing to pay for this on their own.
1	• Tremendous inconsistencies among government agencies and therefore can't put program in place to recover costs.
	• Contracts are still granted based on cost.
	• If the ultimate goal is increase adoption to CMMI, then lower the barriers (costs).
	• SW-CMM entry costs were lower than CMMI (perception).

Votes	Issues
	• ISO 9000 is an international standard. Because of the standardization, you get more consistency.
	• In CMM, the cost of assessments appears to be whatever you can charge and get away with. ISO usually has about 10% variation between proposals/bids.
	SW-CMM 2% market penetration in ten years. Doesn't sound like run-away train. Cost substantially influences business organizations. Numbers in SEI database are from same companies trying to make inroads into the SW-CMM community. Can't get any easier than this. Price of entry is substantially higher • increased scope • increased training costs
8	Much higher than SW-CMM. Need approach to establish market share. We need other restaurant approach.
Discussion	
	Number of organizations at ML 3-5 is far more in India than any other country. COST is important (tried to convince other India organizations to come to workshop).
	Pricing—have to look at other factors in market (cost of living).
	CMMI too costly for India. Then you have it done by someone who isn't as qualified. You lose because you get not $1, let alone $187.00.
4	CMMI is not an American model but an international model. It's in the public domain and the target is the <u>world</u>. Don't charge more to go to museum… What is the logic? This needs to be revisited again.
	36% tax rate of US organizations—US government didn't pay for Disneyland, exhibits for museums. There is a cost model that the SEI uses. Don't have to be an instructor or attend training, but there is a decision. You can pick the model up for free.
12	Decision to extend grandfathering was a good thing but should be extended throughout the transition time.

3.9 Terminology

Table 11 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Terminology." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 11   Terminology

Votes	Issues
6	Some terminology in CMMI is foreign to commercial IT. For example, the word "systems engineering" is often used in IT non-CMM terminology to refer to systems programmers (e.g. mainframe assembler language programmers) or others who are involved in acquiring and maintaining system software, i.e. operating system, security software, etc. Instead of continually adding to the end of CMMI title, e.g. CMMI-SE/SW/IPPD, why not simplify the title of the model, e.g. "CMMI for IT" or just "CMMI"…
5	Terminology stinks in both CMM and CMMI—let's get over it. QA is testing. Word "oversight" in complicated.

3.10 Limited Coverage

Table 12 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Limited Coverage." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 12   Limited Coverage

Votes	Issues
2	I know an organization in France that is working on safety practices—propose as another slash in the name of CMMI (additional discipline).
8	L4 & 5 so sparse because few companies and now wanted more PAs. Expected more results at L4 and L5. L4 and L5 very inconsistent. Further insight into L4 and L5 is needed.
6	Pure IT stepped on slippery slope. CMMI expanded scope and benefit from change is low.
10	What are criteria for inclusion and exclusion of material (PAs) in CMMI? Should there be additional criteria to look at this further? There should be a clearly defined strategy developed by the SEI and stated in the CMMI for the criteria used to determine what is included and excluded from the model. To date, this criteria has been determined by DoD based on the existence of previous models that needed to be merged, e.g., SW, SE, SA, IPPD. Going forward, the SEI should consider other guidelines and criteria, e.g., security management and business objectives.
	L4 and L5—comparison of v1.1 SW-CMM and CMMI v1.02—little difference.
3	Point to [more on] maintenance.
7	Malcolm Baldrige Award was not a source model and fully ½ the [Malcolm Baldrige] points go against the results of your actions. There is a place for business results in CMMI, and this will eliminate the competing dollars.

3.11 Training

Table 13 contains the flip chart notes from the brainstorming of issues and discussion of the issue category "Training." Column two above the "Discussion" bar contains the results of the brainstorming. Column two below the "Discussion" bar contains related points made during participant discussion of the issues. Column 1 contains the number of votes for each issue/discussion point that indicates its importance to the workshop participants.

Table 13   Training

Votes	Issues
19	Do we have enough systems engineering experience under the belts of those training and assessing?
	Opportunity to do cost management. Different types of SCAMPI auditors—maybe certain training they don't need.
20	Don't have enough training experience among those training and assessing. Build training skills.
8	Training your entire tech staff on CMMI doesn't sit well → what are the guidelines? Could be Catch-22 if this is perceived as necessary.
	Though only the process specialist needs to undergo training in CMM, all the people in the organization are required to undergo awareness training in CMMI.
	Initially believed that you only train on processes (QMS) but then had problems. When preparing for assessments, we found this was problem—that they didn't understand what was being talked about.
6	Partition training against ML achievement, domain specific (designers….).

4 Brainstorming on Next Steps and Recommendations

An "affinity group" discussion was held, based on the list of issues identified as important. All issues with three or more votes were discussed. Table 14 contains the flip chart notes from the brainstorming of next steps and recommendations. Column 2, "Issues," summarizes the issue discussed. Column 3, "Recommendations," summarizes the recommendations made by participants to address the issue. Column 1 contains the number of votes for each set of issues/recommendations that indicates its importance to the workshop participants.

Table 14   Next Steps and Recommendations

Votes	Issues	Recommendations
6	Decision to extend grandfathering was a good thing but should be extended throughout the transition time. Huge amount of LAs [for SW-CMM in company] cannot be grandfathered any more. Believe that grandfather period has been extended.	Don't overlook those who lost the opportunity to be grandfathered.
6 3 2	For software-only how do you interpret CMMI consistently, if tailoring is left to individuals' wrong approach—need tailoring guidelines. Need tailoring guidelines and examples—not just saying it is non-applicable. Interpreting for maintenance environment is difficult.	Develop tailoring guidelines for different contexts • software-only • maintenance • COTS products Meta-comment: Some items did not get any vote, but provide possible solutions to these items.
5	No compelling need. Have SW-CMM and it is working and you can't take it away. Worst Case: have to develop an appraisal method.	If SEI cannot sustain SW-CMM, license/give away to party who can: • at minimum v1.1 • release v2 • update v2

Votes	Issues	Recommendations
4	Not just method issue but also model, continued maintenance of SW-CMM (CMM V2) for organizations that are predominately software.	Promote SW-CMM to ISO status. Sponsored by ISRI. Allow the transition/sunset to be determined by the market • only transition if clear need Interpret CMMI for software. Apply SCAMPI to SW-CMM.
4	Due to the expanded scope, demands other approaches for doing appraisals— • delta appraisals • multi-phase appraisal • surveillance appraisal	Solution to other approaches for doing appraisals helps address solution to critical information for CMMI compliance issue.
2	If I only assess 80% and say I'm CMMI compliant then I'm leaving out critical information, not truthful to customer.	
4	Data is across the board and retrospective. Need to provide a framework for collecting and reporting data: - demographics - starting performance - type of data What do we mean by cost/investment?	Need to provide business ROI model to be predictor Guidelines for validating the data are used for ROI and ensure comparability. Guidelines for collecting and analyzing the data.
3	Argument on ROI data w/out thinking about ROI model. Do I want to go to ML4 &5 in SW-CMM or do I want to go to CMMI? Business ROI model should be built to be a predictor. Common terminology and syntax.	One ROI framework should support both models SW-CMM and CMMI to allow for valid comparison. Guidelines for two roles: • organizations who provide ROI data • SEI to take data
1	CMMI more holistic approach—1) huge culture change 2) transition—not having proper roadmap 3) roadmap 4) leverage investment $\rightarrow$ solve and adoption will occur.	Asking SEI to play data steward role may be wrong priority.

Votes	Issues	Recommendations
1	Business decision—Do we want to spend money on SW-CMM or CMMI? ROI data on both SW-CMM and CMMI (comparison).	Previous point is not a binary decision; perhaps SEI can do something minimal (ROI) of good benefit.
6 1	For software-only how do you interpret CMMI consistently, if tailoring is left to individuals' wrong approach—need tailoring guidelines. MA is good with expanding business imperatives—this needs to be emphasized and expanded even more.	"Competing numbers" → "Competition between business development dollars and process improvement dollars" Commercial community is less contract driven and more market driven. Process improvement associated with (driven by) business goals is better. For example, exploiting continuous representation is a possible approach/solution Malcolm Baldrige is "business excellence" model for given company versus SW-CMM/CMMI is development model; latter is subset of former. Specific suggestions toward broadening SW-CMM/CMMI : • Add business goal-driven metrics to model • Or forthcoming (needed) SEPG guide "Business excellence" is unnatural fit in model (oppose previous point). Subcategory 7.4 of Malcolm Baldrige = internal results from process management; category 2 links to much of what you do for process management and human resources. CMMI partially covers category 5 (also People CMM). CMMI fits much better in Malcolm Baldrige framework. Clarification: point of 10 is not limited to Malcolm Baldrige (but get business success/value is).

2	Don't have enough training experience among those training and assessing. Build training skills.	There are existing requirements for training experience for LAs and model trainers, they should be enforced and verified.

5 What Would Make You Transition to CMMI V1.1?

To summarize the issues captured during the workshop and to understand the most critical issues, the question was then asked: "What Would Make You Transition to CMMI v1.1?" Every workshop participant was encouraged to address this question. Table 15 summarizes the discussion.

Table 15   What Would Make You Transition to CMMI?

What Would Make You Transition to CMMI…?
If I had ROI from transitioning SW-CMM to CMMI, that demonstrates positive benefit (even if it isn't the prettiest data).
A story that shows <u>benefit</u> (might be qualitative versus quantitative).
Establish incremental roadmap—a <u>path</u> from SW-CMM to CMMI. • Acknowledge SW-CMM is a [means] to superset CMMI.
Lower level of entry cost. • (reuse investment)
Difficulty is not the issue, <u>but applicability</u> [of PAs or goals] is (and uncertainty of how LAs will judge applicability versus not applicable).
If official tailoring/interpretation guidelines are available to address this.
When I reflect on clients in terms of what causes them to willingly make a transition: 1) Three things: Knowledge (knowledge of model and how used), understanding of how it will help organizational performance, and time to make the transition. 2) Remember: We're still in the early adopters' phase. 3) And: Some will say "over my dead body"—nothing will matter.
What will drive one to CMMI: • Customer or senior management—dissatisfied (pained) at something that is addressed (better) by CMMI.

Would ease the transition: • Need to understand why SEI costs the transition mechanisms the way it does. • Above would <u>ease</u> the transition.
Organizations need <u>time</u> to look at CMMI (agree with knowledge, understanding, time)
Give the market the time.
(CMMI is international venture) • Increase accessibility to training (LA, Intermediate, and Train-the-Trainer) for transition partners; revisit tax.
SEI should ask its own IT organization: what will cause you to transition to CMMI? 1) interpretation guidelines 2) data on benefits 3) time needed to understand and consider (above a <u>partial</u> summary)
One scenario; if (CMMI were) mandated by customer/contract, this would speed adoption: • Downside: acquisition organization then de-scopes process. • Some commercial customers do ask for ML. • A DoD mandate would drive adoption some. • A pro/con to interpretation guideline: → it helps but can be bible.
There are always issues with a model. Some of them may be good issues (should be fixed). The real <u>issue</u> is can they be <u>worked</u>? Or, does it need to be revised?

6 Conclusions

The SEI and ISRI are taking all of the feedback from this workshop into consideration in determining how to best support the process-improvement community. A number of different perspectives were represented by the workshop participants.

There was considerable discussion (and disagreement) about the need for a software-only model. Possible software-only solutions included (1) maintaining the Software CMM indefinitely, (2) creating a Software-only version of CMMI, and (3) building CMMI interpretation guidelines for software-only organizations.

Some participants felt strongly about the need for defining a strategy and criteria for what should be included in future releases of CMMI. Examples suggested included security management and business success factors.

Based on the workshop discussions, the SEI has identified four main tasks it will pursue:

- providing interpretation guidelines for specific types of organizations (e.g., software)
- soliciting data on benefits, including both quantitative and qualitative data
- providing time for the community to understand and consider CMMI, since it is early on the adoption curve
- revisiting the business model for CMMI transition

The issues and suggestions from this workshop will be analyzed and combined with issues and suggestions received from other areas of the community. The SEI desires to eliminate as many adoption issues as possible to make the transition to CMMI easy for all members of the process-improvement community.

In turn, ISRI will consider the workshop discussions when it is developing collaborations with the SEI and undertaking efforts to sustain process-improvement initiatives for the global software community.

We would once again like to thank everyone who submitted a position paper and/or attended the workshop. Your inputs will help us to understand what we must do to continue to support software process improvement.

References

SEI 01a
CMMI Product Development Team. *ARC V1.1, Appraisal Requirements for CMMI, Version 1.1 (CMU/SEI-2001-TR-034, ESC-TR-2001-034).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, December 2001. <http://www.sei.cmu.edu/publications/documents/ 01.reports/00tr034.html> [SR148.bk]

SEI 01b
CMMI Product Development Team. *SCAMPI V1.1, Standard CMMI Appraisal Method for Process Improvement: Method Description, Version 1.1 (CMU/SEI-2001-HB-001).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, October 2000. <http://www.sei.cmu.edu/ publications/documents/01.reports/01hb001.html>. [SR149.bk]

SEI 02a
CMMI Product Development Team. *CMMI for Systems Engineering/Software Engineering, Version 1.1 Staged Representation (CMU/SEI-2002-TR-002, ESC-TR-2002-002).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, January 2002... <http://www.sei.cmu.edu/publications/documents/02.reports/ 02tr002.html> [SR144]

SEI 02b
CMMI Product Development Team. *CMMI for Systems Engineering/Software Engineering, Version 1.1 Continuous Representation (CMU/SEI-2002-TR-001, ESC-TR-2002-001).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, January 2002... <http://www.sei.cmu.edu/publications/documents/02.reports/ 02tr001.html> [SR145]

SEI 02c
CMMI Product Development Team. *CMMI for Systems Engineering/Software Engineering/Integrated Product and Process Development, Version 1.1 Staged Representation (CMU/SEI-2002-TR-004, ESC-TR-2002-004).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, January 2002. <http://www.sei.cmu.edu/ publications/documents/02.reports/02tr004.html>. [SR146]

SEI 02d   CMMI Product Development Team. *CMMI for Systems Engineering/Software Engineering/Integrated Product and Process Development, Version 1.1 Continuous Representation (CMU/SEI-2002-TR-003, ESC-TR-2002-003).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, January 2002. <http://www.sei.cmu.edu/publications/documents/02.reports/02tr003.html> [SR147]

SEI 02e   CMMI Product Development Team. *CMMI for Systems Engineering/Software Engineering/Integrated Product and Process Development/Supplier Sourcing, Version 1.1 Staged Representation (CMU/SEI-2002-TR-012, ESC-TR-2002-012).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, March 2002. <http://www.sei.cmu.edu/publications/documents/02.reports/02tr012.html>. [SR146]

SEI 02f   CMMI Product Development Team. *CMMI for Systems Engineering/Software Engineering/Integrated Product and Process Development/Supplier Sourcing, Version 1.1 Continuous Representation (CMU/SEI-2002-TR-011, ESC-TR-2002-011).* Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, March 2002. <http://www.sei.cmu.edu/publications/documents/02.reports/02tr011.html> [SR147]

REPORT DOCUMENTATION PAGE

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
(Leave Blank)	August 2002	Final

4. TITLE AND SUBTITLE	5. FUNDING NUMBERS
A Report on the May 2002 CMMI Workshop: Adoption Barriers and Benefits for Commercial Software and Information Systems Organizations	F19628-00-C-0003

6. AUTHOR(S)

Mike Konrad, Mary Beth Chrissis, Bill Curtis, and Mark Paulk

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Software Engineering Institute Carnegie Mellon University Pittsburgh, PA 15213	CMU/SEI-2002-SR-005

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
HQ ESC/XPK 5 Eglin Street Hanscom AFB, MA 01731-2116	

11. SUPPLEMENTARY NOTES

12A DISTRIBUTION/AVAILABILITY STATEMENT	12B DISTRIBUTION CODE
Unclassified/Unlimited, DTIC, NTIS	

13. ABSTRACT (MAXIMUM 200 WORDS)

This special report summarizes the results of the CMMI® (Capability Maturity Model® Integration) Workshop held May 7-8, 2002. This workshop focused exclusively on CMMI and two types of organizations: commercial software organizations and information systems organizations. The purpose of the workshop was to identify for these types of organizations: (1) barriers to the adoption of CMMI, (2) benefits of CMMI adoption, (3) issues created by the migration from SW-CMM® to CMMI. The results of this workshop are collections of comments concerning these defined topics regarding CMMI. No interpretation of these comments is provided

14. SUBJECT TERMS	15. NUMBER OF PAGES
CMMI, Adoption, Workshop, SCAMPI	48

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89) Prescribed by ANSI Std. Z39-18 298-102

® CMMI, CMM, and Capability Maturity Model are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.